TITLE: DIMMER DEVICE FOR BACKLIGHT MODULE

BACKGROUND OF THE INVENTION

(a) Field of the Invention

The present invention is related to an improved structure of a backlight module dimmer device, and more particularly to one that effectively distribute lights from light sources without developing bright band and dark band.

(b) Description of the Prior Art:

As illustrated in Fig. 1 (A) of the accompanying drawings for an improved structure of a LCD backlight module of the prior art, the backlight module is essentially comprised of a reflector mask 10, multiple light sources 20, a diffuser plate 30, a lower diffuser sheet 40, a prism 50, a reflective polarizing sheet or an upper diffuser sheet 60 and a LCD 70 arranged in sequence from inside out. Wherein, those light sources 20 may be each a light tube in a stripe, U-shape or other continuously curve and arranged at a proper spacing between the reflector mask 10 and the diffuser plate 30 and the lights emitted by each of those light sources 20 provide the display effects by the LCD module. As generally found available in the market, multiple optical films disposed between the diffuser 30 and the LCD module may be comprised of 1~3 diffuser sheets, 0~2 brightness enhancement films and one reflective polarizing sheet with the purpose of creating diffusion for the lights passing through those optical films so to correct the phenomena of bright band and dark band formed on the LCD module due to the absence of light emitted to where between any abutted light sources.

Whereas the diffuser plate 30 functions only to help achieve

the even diffusion for lights passing through it, it has a limited efficiency in correcting the phenomenon of the bright band and the dark band observed on the LCD module. To this, an improvement is made for certain backlight modules by having extended on purpose the distance between those light source 20 and the diffuser plate 30 in the hope of widening the scope of each of those light sources 20 entering into the diffuser plate 30 to achieve the purpose of reducing the dark band. However, the structural design for such an improvement not only provides limited effects but also results in that the backlight module must be made thicker to fail the compact requirements of the LCD module.

Furthermore, some other backlight modules seeks to provide extinction (dispersion) on the surface of the diffuser plate by printing on the diffuser plate with ink containing SiO_2 or TiO_2 to achieve the purpose of reducing the dark band. Again, the extinction process not only increases the production cost of the diffuser and the complexity of the manufacturing process, but also relates to a passive solution to reduce the dark band on LCD since the extinction is created only after the light lands on the surface of the diffuser.

Further improvement as illustrated in Fig. (B), multiple dimmer devices 12 are provided on the reflector mask 10 of the backlight module. The highly reflective surface of the dimmer device 12 reflects the light emitted from the light source to eliminate the dark band between any abutted light sources. However, the dimmer 12 integrated with the reflector mask 10 functions only the purpose of reflective dimming and fails to provide refractive or diffusive dimming function.

SUMMARY OF THE INVENTION

The primary purpose of the present invention is to provide an improved structure of a dimmer device to actively and effectively solve the problems of the significant bright band and dark band observed with the LCD module of the prior art to more effectively distribute the lights emitted form the light sources. To achieve the purpose, one or more than one dimmer device is disposed between the spacing between light sources to evenly diffuse the lights diffused from both sides of the light sources towards the diffuser plate after having been properly refracted and reflected, thus to eliminate the dark band between any abutted light sources.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 (A) is a sectional view of the structure of a backlight module of the prior art.

Fig. 1 (B) is a sectional view of the structure of another backlight module of the prior art.

Fig. 2 is a sectional view of a backlight module of a first preferred embodiment of the present invention.

Fig. 3 is a sectional view of a backlight module of a second preferred embodiment of the present invention.

Fig. 4 is a sectional view of a backlight module of a third preferred embodiment of the present invention.

Fig. 5 is a sectional view of a backlight module of a fourth preferred embodiment of the present invention.

Fig. 6 is a sectional view of a backlight module of a fifth preferred embodiment of the present invention.

Fig. 7 is a sectional view of a backlight module of a sixth preferred embodiment of the present invention.

Fig. 8 (A) is a sectional view of a backlight module of

a seventh preferred embodiment of the present invention.

Fig. 8 (B) is a sectional view of a backlight module of an eighth preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to Fig. 2, a first preferred embodiment of the present invention is essentially comprised of the backlight module is essentially comprised of a reflector mask 10, multiple light sources 20, a diffuser plate 30, a lower diffuser sheet 40, a prism 50, a reflective polarizing sheet or an upper diffuser 60 and a LCD 70 arranged in sequence from inside out. Wherein, those light sources 20 may be each a light tube in a stripe, U-shape or other continuously curve and arranged at a proper spacing between the reflector mask 10 and the lower diffuser sheet and the lights emitted by each of those light sources 20 provide the display effects by the LCD.

One or more than one solid or hollow dimmer device 80 is provided at where between any abutted light sources 20. In a first preferred embodiment of the present invention as illustrated in Fig. 2, the dimmer device 80 is made in a structure of stick bounded to the reflector mask 10, or in a second preferred embodiment as illustrated in Fig. 3, an insertion mechanism 100 is provided on the dimmer device 80 to be incorporated to the reflector mask 10 or the mechanism below the reflector mask 10 for the dimmer device to be firmly secured to a proper position on the reflector mask 10. The insertion mechanism 100 is provided with a locking pin 91 at where between the dimmer device 80 is bounded to the reflector mask 10 while a locking hole 11 is provided to the reflector mask 10 in relation to the respectively locking pin 81 for the dimmer device 80 and the reflector mask 10 to lock to each other. Alternatively, an

insertion member may be separately provided to lock the dimmer device 80 and the reflector mask 10 by means of adhesion, insertion or a screw. As illustrated in Fig. 4 for a third preferred embodiment, the insertion mechanism 100 is disposed with a threaded hole 92 between where the dimmer device 80 is bounded to the reflector mask 19 while the locking hole 11 is provided on the reflective mask 10 to permit the insertion of a screw 90 to fasten the dimmer device 80 to the reflector mask 10 or the mechanism below the reflector mask 10.

Whereas the dimmer device 80 of the present invention is provide between any abutted light sources 20, the lights diffused from both sides of the light source passing through is properly refracted and reflected by the dimmer device 80 before being evenly diffused towards the diffuser plate 30 to provide an active means in eliminating the dark band created between abutted sources for more effectively distributing lights emitted from the light source.

The dimmer device 80 may be made of plastic materials including but not limited to Polycarbonate (PC), or Polymethyl methacrylate (PMMA), or Polyethylene Terephthalate (PET) in to a white or transparent stick structure, or made of transparent plastic materials, e.g. PC or PMMA added with diffusion agent (such as SiO2 or TiO2) in a white mat stick structure so to produce the dimmer device 80 with various refraction effects for the selection of the proper dimmer device 80 depending on the spacing between the backlight module and the light source 20.

Now referring to Fig. 5 for a fourth preferred embodiment of the present invention, wherein, at least one surface of the dimmer light device 80 is locally or entirely distributed with

embossment 83 in a form of V-, U-, or C-shaped cut, or multiple straight lines or curves or combination of both on the surface facing the lower diffuser plate 30 and the light source 20 in the fourth preferred embodiment of the present invention; or as illustrated in Fig. 6 for a fifth preferred embodiment of the present invention, wherein, multiple convex surfaces in various curvatures 84 are disposed. The dimmer device 80 is formed by a different convex or flat surface for the embossment 83 or the convex surface to create light converging effect. Alternatively, as illustrated in Fig. 7 for a sixth preferred embodiment of the present invention, various changes in the shape and the distance of the arrangement are feasible depending on the size of the light source 20 or the length of the spacing between abutted light sources 20. The shape of the dimmer device 80 varies depending on the angle of the disposition of the light source 20 as illustrated in Figs. 8(A) and 8(B) respectively of a seventh and an eighth preferred embodiments of the present invention; wherein, either the appearance, size or shape of those dimmer devices 80 are continuously changed so that the lights emitted form the light source 20 can be diffused from the embossment 83 or the convex surface 84 on the diffuser plate 30 to more effectively solve the problem of the significant bright band and dark band of the LCD module of the prior art. Alternatively, the same effects can be achieved by having at least one surface of the dimmer device 80 locally or entirely matted, or printed with ink, or distributed with concave and convex points in either round, rectangular, diamond or polygonal form.

The present invention provides an improved structure of a dimmer device for a LCD module and this application is duly

filed for a utility pattern. It should be noted that the specification and drawings are provided as one of the preferred embodiments of the present invention and do not in any way limit the present invention. Therefore, any structure, device, and/or characteristics similar or equivalent to that of the present invention shall be deemed as falling within the scope of the purpose and claims made by the present invention.